> the art to provide for the detection of a single photon in the method of Hoyle.

Further at page 7 the Examiner stated in pertinent part in response to the earlier filed arguments that:

> In the present application, the advantage of detection of small amounts of radiation is well known in the art of radiation detection. Therefore, one of ordinary skill in the art of radiation detectors, in possession of an understanding of the Hoyle reference, would recognize that the detection of single photons is desirable and be led naturally to implement the methods of increasing described in Hoyle. Therefore the use of the methods described in Hoyle for providing single photon detection is considered obvious.

The rejection is traversed on the grounds that the Examiner does not provide proper motivation for the combination of references. It is understood that the chief reference is Il'in and that Hoyle is cited for teaching that the detector temperature is below the critical temperature. Therefore the Examiner believes that in combination the two references meet Claim 1. The Examiner appears to have misstated the relevance of Hoyle. The Examiner stated that "Hoyle does teach that strips with small widths are sensitive to lower energy impacts ...". However, Hoyle was actually cited by the Examiner to meet the claim element "providing a superconductor strip maintained at a temperature below its critical temperature". Note that the earlier amendment to Claim 1 was directed to this aspect of Claim 1 and not to the critical current or the width of the detector strip. Claim 1 is silent on the strip width. Hoyle does disclose a temperature below critical temperature. However, this is in the context of the Hoyle detector which is not intended for detecting photons (light) at all but instead is intended to detect particles; see col. 6, lines 1 through 2, and col. 6, lines 40 and following, where the particles are from a molecular beam. What Hoyle describes as a "low energy" particle has an energy as low as 10 electron volts; see Hoyle, col. 6, lines 1 through 2. Of course this is a much higher energy than is typical of a photon, which would typically have an energy of 1.5 electron volts or less. The differences in the type of detector used by Hoyle is emphasized by thickness of the Hoyle superconductor strip which is described as being 500 Ångstroms (50 nanometers) thick. See Hoyle, col. 5, lines 24 through 28.

In contrast, the Il'in semiconductor strip is only five nanometers thick, suitable for detecting light (photons).

LAW OFFICES OF
SKJERVEN MORRILL LLP
25 METRO DRIVE
SUITE 700
SAN JOSE, CA 95110
(408) 453-9200
FAX (408) 453-7979

Even if Hoyle does disclose the temperature below critical temperature in the context of superconductor detectors, it is still not seen why the combination with Il'in is properly motivated. Detecting photons is not the same as detecting molecular beam ions. The substantial difference in the film thicknesses emphasizes this as does the difference in the energy of the incoming Hoyle particles versus the Il'in photons. The Examiner has not defined what he considers to be the relevant field, whether it is detection of photons or superconductor detectors or some combination thereof. A proper rejection relying on a combination of references must include the motivation to combine the references in terms of the relevant field to which they are addressed. The Examiner appears to have skipped this step of the analysis.

If the relevant field is photon detection , then Hoyle would not be considered relevant and there is no reason why the hypothetical person of ordinary skill in the art would look to Hoyle. If the field is more broadly superconducting detectors, then, since Il'in teaches operating at a temperature above the critical temperature, Hoyle teaches away from this aspect of Il'in for detecting "low energy particles" and since photons are of low energy, hence again the combination seems to lack support.

Given the substantial difference in the energy of the incoming particles (in Il'in being photons, that is 1.5 electron volts and below) and Hoyle (particles of ten electron volts and above), it is not seen why one of ordinary skill in the art would understand that improving sensitivity in Il'in would require going from a temperature above critical temperature to a temperature below critical temperature. Note that Il'in explicitly discloses (see page 3939, left col., third paragraph) "Practically no photoresponse signal was observed at temperatures far above T_C, as well as below $T = 10K$. We did not observe the signal at $T << T_C$, since in this temperature range the response of HEPs is determined by the change of the DUT kinetic inductance, but this effect at relatively low frequencies ... is known to be at least two orders of magnitude smaller than that of the direct electron-heating response. Thus, our studied temperature range corresponded to the superconducting transition ...".

Thus, Il'in specifically rejects operating at a temperature much <u>below</u> critical temperature as not working for photon detection. Therefore, Il'in teaches away from the Hoyle operating temperature. Due to this teaching away by the first reference of the relevant feature of the second reference, the Examiner must overcome the burden of why the teaching away is overcome by another teaching in one or the other of the references or elsewhere in the prior art. The Examiner has not done so. Note also that the reference in Il'in "to

LAW OFFICES OF
SKJERVEN MORRILL LLP
25 METRO DRIVE
SUITE 700
SAN JOSE, CA 95110
(408) 453-9200
FAX (408) 453-7979

photoresponse". This emphasizes that Il'in is involved with photon detection, not particle (molecular beam ion) detection. This emphasizes again that the Examiner's suggested motivation for the combination of the two references is inadequate, and so Claim 1 is allowable.

There is a further reason why the combination of Il'in and Hoyle is not properly motivated. In accordance with the present invention, the superconducting strip detects single incident photons because the incident photon causes a localized "hot spot" on the strip, making that spot less conductive and forcing the biasing current to flow around it until that current causes additional local heating which increases resistance until (briefly) the entire width of the strip is non-superconducting. Hoyle discloses a somewhat similar "hot spot" phenomenon at col. 6, lines 8-37. But, Il'in does not disclose or even mention this "hot spot" detection, and it is believed that at Il'in's higher operating temperature it would not occur. Thus one of ordinary skill in the art (whatever the art is) would not look to Il'in to combine with Hoyle since the physics of the detection phenomenon differs. If anything, the Hoyle disclosure indicates that hot spot formation followed by localized superconductivity breakdown would not occur with low energy particles such as photons.

Note that independent Claim 7 recites language similar to that of Claim 1 in respect to the "said superconducting film is maintained at a temperature below its critical temperature ...". Hence Claim 7, for reasons similar to those as pertain to Claim 1, is allowable.

Therefore, since it is respectfully submitted that the combination of the two references lacks adequate motivation due to the teaching away of the (primary) Il'in reference from the cited feature of the (second) Hoyle reference, the rejection is improper and should be withdrawn. It is requested that the Examiner reconsider the rejection, withdraw it and pass this case on to issue with all pending Claims 1 through 19 allowed.

EXPRESS MAIL LABEL NO:
EV 174 806065 US

Respectfully submitted,

Norman R. Klivans

Norman R. Klivans
Attorney for Applicants
Reg. No. 33,003
Telephone No.: (408) 453-9200

LAW OFFICES OF
SKJERVEN MORRILL LLP
25 METRO DRIVE
[illegible]
SAN JOSE, CA [illegible]